

Synaptic Tag as a Means to Teach Neuroscience to Fifth Graders

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Introduction

Our purpose was to demonstrate the action of neurotransmitters and enzymes in the synapse. In 1961, Davis proposed that the general mechanism of synaptic transmission is as follows: “stimulation (of a sense receptor) produces a receptor potential which causes the liberation of a transmitter. On its arrival at the post-synaptic side, this transmitter produces a generator potential which initiates the action potential in the (post-synaptic) neurone” (Davis, 1961). This elementary understanding of the travel of the action potential across the synapse became the accepted model of transmission. Due to the abundance of research on synaptic transmission, the mechanisms have now been well characterized.



When the neurotransmitters successfully reached the other side of the synapse without being tagged, they received a candy reward.

This impaired the enzymes’ abilities to regulate the potential. Although the ways in which transmission was modeled were not entirely accurate, we feel that the inaccuracies we allowed dramatically increased the ease of understanding.

Results

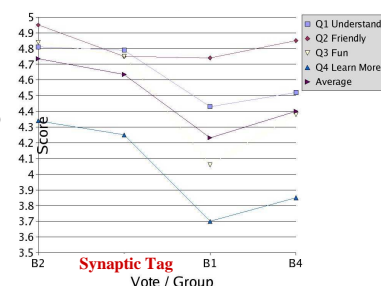
Our model was successful at teaching fifth graders about the synapse. This fact is shown by the high scores our model received and its overall ranking of second place. After running through the game once, we would ask the kids to explain the resulting neurotransmission. They were able to accurately reveal the correct outcomes. On the grading sheets, many students commented that the game was fun and that they liked running. They also wrote that they learned about neurotransmitters, enzymes, and drug mechanisms.



Although our model served its purpose very well, there were some limitations. For example, to make the model reach the level of understanding of a fifth grader, we had to simplify the enzyme mechanism, drug action, neurotransmitter binding, and diffusion. Overall, I feel that our model was a very effective tool for teaching the complex topic of neuroscience to fifth grade students because they had fun while they participated. It is very important for the students to have fun because they will be more likely to remember the details of the game if they enjoyed playing it.

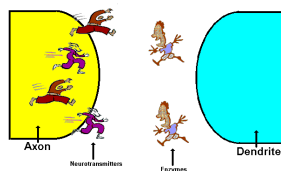
Discussion

In our model, we demonstrated to fifth graders the basic mechanism of synaptic transmission. We promoted the interest of the students by having them become one of the essential transmission elements. The purpose of the game was for the neurotransmitters to run across the synapse to “trigger” the potential in the post-synaptic cell. However, to add difficulty and fun, two students were enzymes in the synapse. Their job was to prevent the neurotransmitters from triggering a signal in the post-synaptic neuron. In a second set of trials, a drug prevented the enzymes from moving their feet.



Methods

Our project modeled the neural synapse. To create the space that represented the synaptic cleft, we put tape on the floor in the shape of a rectangle ten feet wide by fifteen feet long. The kids were part of the model. Two kids, labeled enzymes, stood in the synapse. The remaining kids were neurotransmitters. In the first set of trials, the goal of the enzymes was to catch the neurotransmitters, thus preventing synaptic activation. During a second set of trials, the enzymes were required to stand in one place because they were inactivated with drugs.



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